IES LM-79-08

MEASUREMENT AND TEST REPORT

For

SHENZHEN TUBU TECH CO.,LTD

Building C,Hankun Hi-tech Industrial Zone,Longteng Road,Gaoqiao District,Pingdi,Longgang,Shenzhen,Guangdong,China.

Test Model: TBG4-150W(4000K)

Report Type:	Electrical and Photometric tests including: Luminous Flux, Power Factor, Chromaticity, Luminous Intensity Distribution, THD
Test Engineer:	Hexy He
Report Number:	RSZ170314521-10
Test Date:	2017-03-17 to 2017-03-21
Report Date:	2017-07-13
Reviewed By:	Blake Zhang / EE Engineer
Prepared By:	Bay Area Compliance Laboratories Corp. (Dongguan). No.69,Pulongcun ,Puxinhu Industrial Area, Tangxia , Dongguan, Guangdong, China. Tel: +86-0769-86858888 Fax:+86-0769-86858588
Accreditation:	The IAS Accreditation Number TL-460.

1. Product Description

General Information:

One sample was received on 2017-03-14 and used for testing.

Model Tested:	TBG4-150W(4000K)
Manufacturer:	SHENZHEN TUBU TECH CO.,LTD
Brand Name:	TUBU
Product Designation:	High-bay Luminaires for Commercial and Industrial Buildings
Burning Time Before Test:	0hour(For New Products)

Rated Values:

Rated Voltage/Frequency:	100-277 V AC 50/60Hz
Rated Power:	150 W
Nominal CCT:	4000K
Nominal Lumen Output:	19500 lm

2. Standards Used

- IES LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting
- IES TM-30-15: IES Method for Evaluating Light Source Color Rendition (This method is not in IAS accreditation scope)

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
1.5m temperature integrating sphere	SENSING	SPR-600	S09008	25～50°C	2017-03-09	2018-03-09
High-precision rapid spectral analysis system	EVERFINE	HAAS-2000	M112048CA1361125	380-780nm	2017-07-07	2018-07-07
Digital power meter	YOKOGAWA	WT310	13398	N/A	2016-12-05	2017-12-05
Programmable Precision DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2017-03-03	2018-03-03
thermometer	SENSING	NA	NA	25、50°C	2017-03-09	2018-03-09
Standard Light Source	SENSING	NA	LSD090808	N/A	2016-12-05	2017-12-05
Precision frequency power supply	ALL Power	APW-105N	970613	220V±10% 50Hz	2017-03-03	2018-03-03
AC POWER SUPPLY	EVERFINE	VPS1030 PWM	1012017	0-150V， 0-300V	2017-03-03	2018-03-03
Digital CC&CV DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2017-03-03	2018-03-03
Digital power meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2017-03-03	2018-03-03

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
full-field speed goniophotometer	EVERFINE	GO-R5000	YG108492N10120001	1600mm,3000W/10A	2017-03-09	2018-03-09
Wireless Remote Sensor	N/A	433MHz	N/A	0°C~50°C;-20°C~60°C	2017-03-20	2018-03-20
Standard Light Source	EVERFINE	D908	1012003	N/A	2016-12-17	2017-12-17

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Dongguan) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at 25°C±1°C during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, Spectroradiometer, and integrating sphere. The integrating sphere system is calibrated by standard spectrum light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is U=2.1% (K=2), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is U=32K (K=2), at the 95% confidence level. The uncertainty of the CRI is U=2.1 (K=2) , at the 95% confidence level.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.15% of rdg, Power U=0.20%) (K=2), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report. The vertical angle (γ) test intervals were set no more than 1 degree while data for 5 degree intervals is reported. The horizontal angle (C plane) test intervals were set no more than 22.5 degree.

The uncertainty of the luminous intensity is U=1.6% (K=2) , at the 95% confidence level.

Additional Test

The Additional Test item may not be covered by IESNA LM-79-2008. Additional test including power factor, off-state power and THD, was measured by Digital Power Meter after stabilized at 25°C±1°C.Test voltage for THD and power factor test would be equal to rated voltage or, in case of a voltage range, maximum value of that range.

The uncertainty of power meter AC current U=0.19 % of rdg, AC Voltage U=0.15% of rdg, Power U=0.20%) (K=2), at the 95% confidence level.

Fidelity Index and Gamut Index Calculation

The R_f, R_g was calculated according to IES TM-30-15 by using calculation tools. The calculation was based on the measured SPD from 380nm to 780nm with 1nm intervals. All the colors in this report is for reference only.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

Photometric and Electrical Measurement Result

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Luminous Flux(lm)	Efficacy (lm/W)
120.0	60	1.283	153.1	0.9951	19144	125.02

Radiant Flux (W)	CCT (K)	Duv	x	y	u'	v'
59.543	4114	-0.000298	0.3753	0.3729	0.2233	0.4991

Color Rendering Index

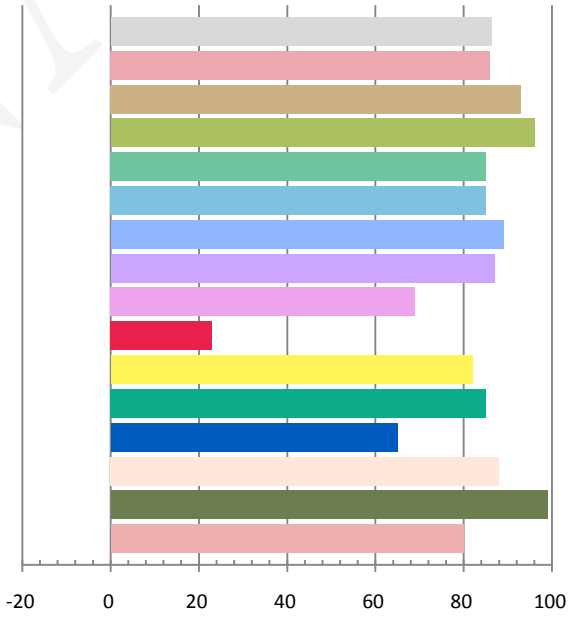
Ra
86.3

R1	R2	R3	R4
86	93	96	85

R5	R6	R7	R8
85	89	87	69

R9	R10	R11	R12
23	82	85	65

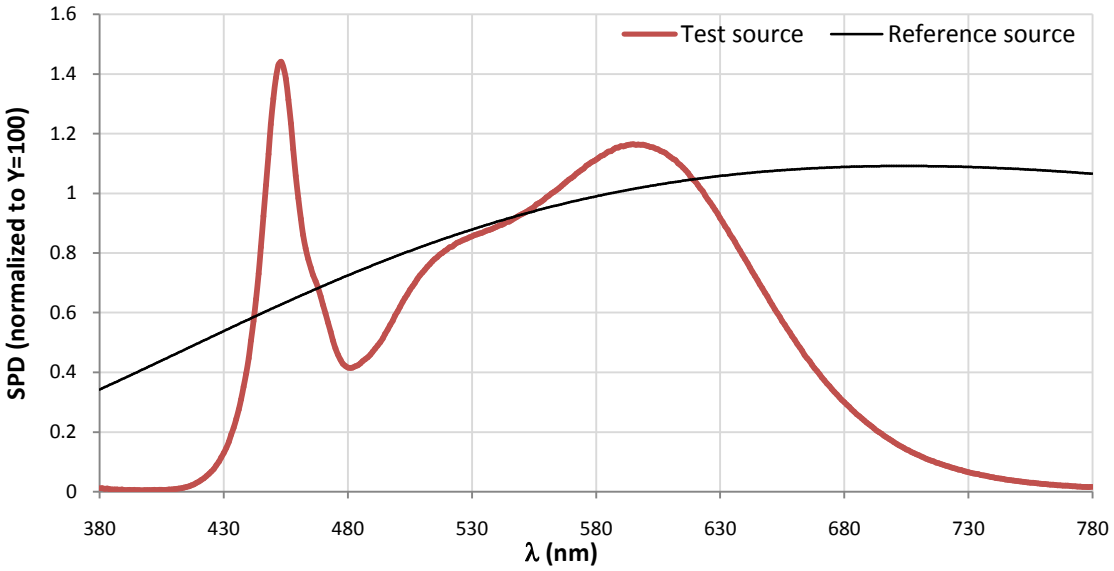
R13	R14	R15
88	99	80



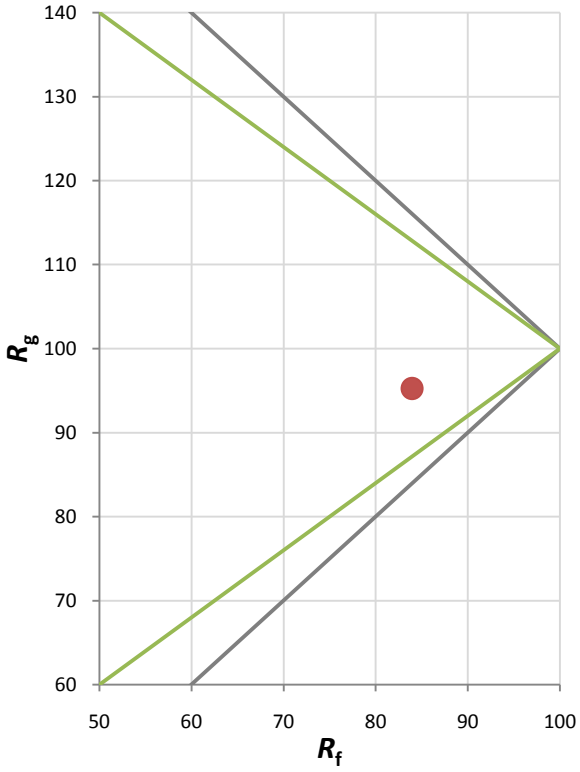
Fidelity Index and Gamut Index

Fidelity Index R_f	84
Gamut Index R_g	95

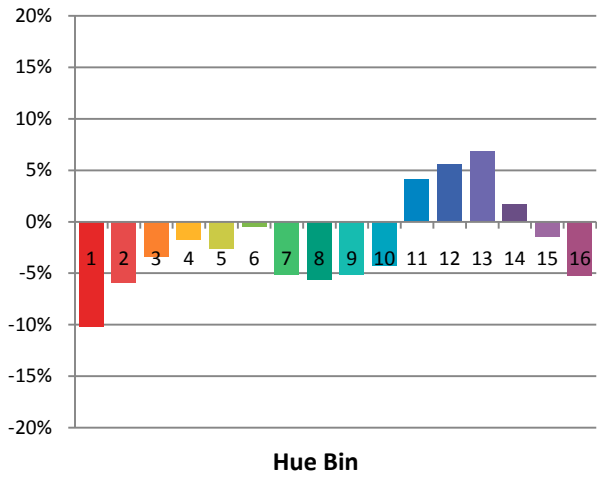
Spectral Power Distribution Comparison



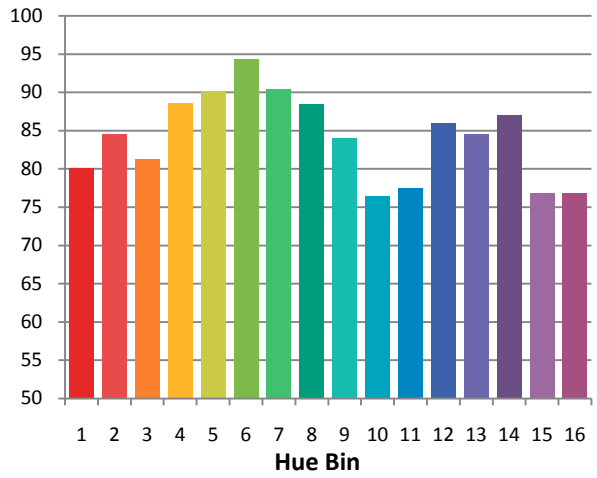
Plot of R_g versus R_f



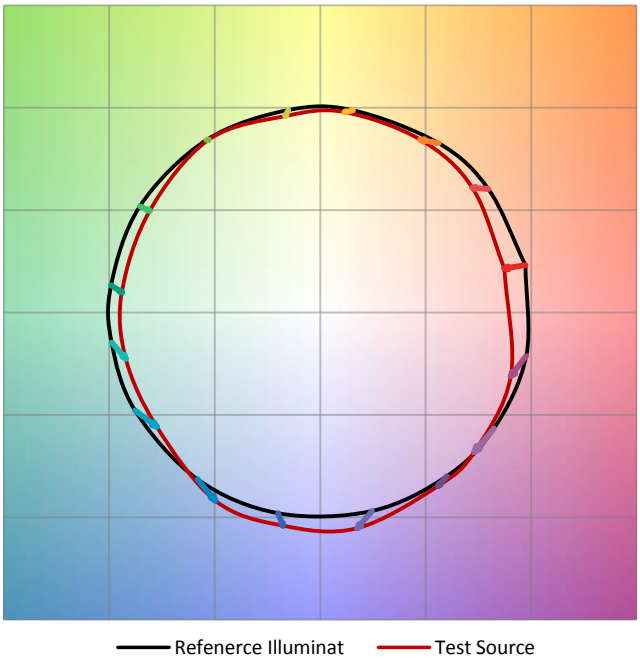
Chroma Shift by Hue



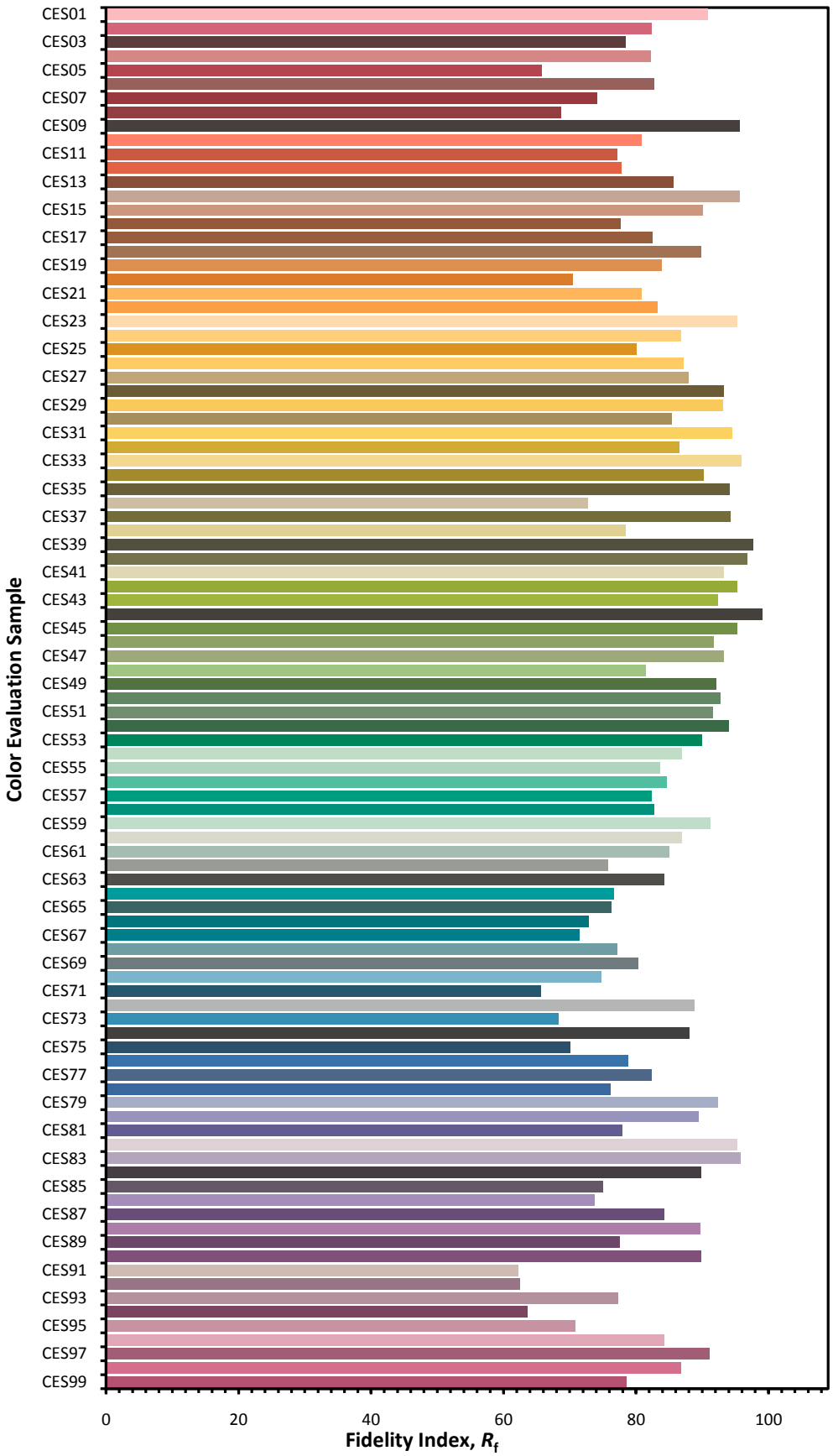
R_f by Hue



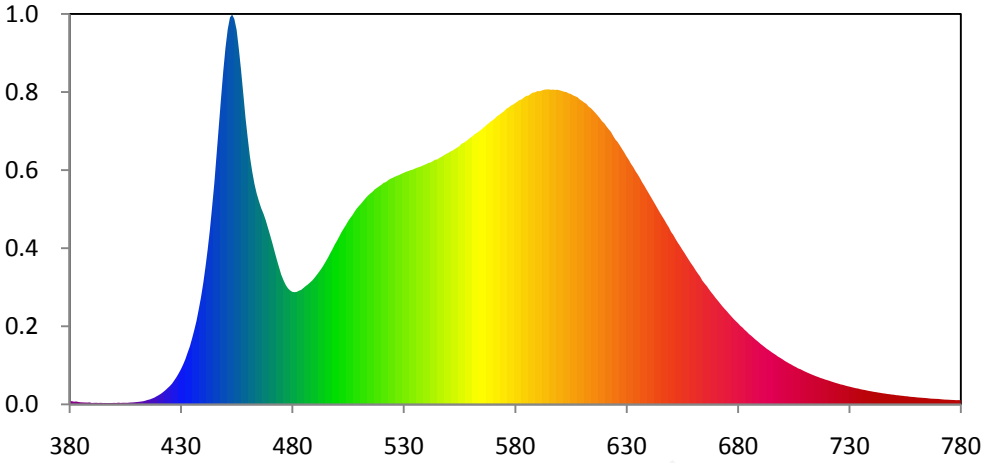
Color Vector Graphic



Color Fidelity by CES Sample



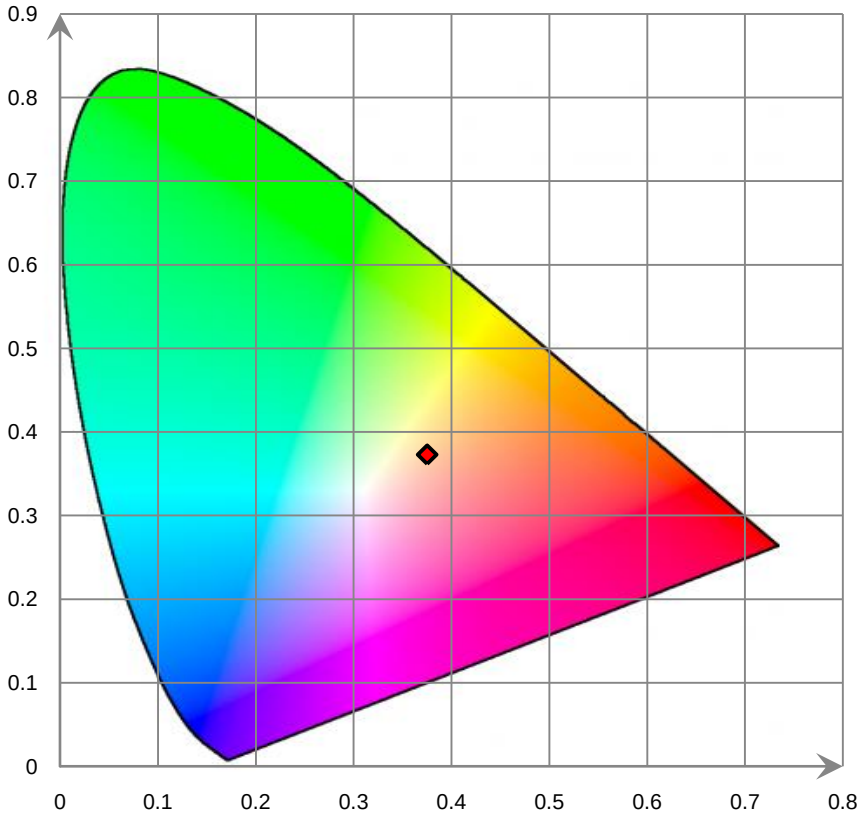
Relative Spectral Power Distribution



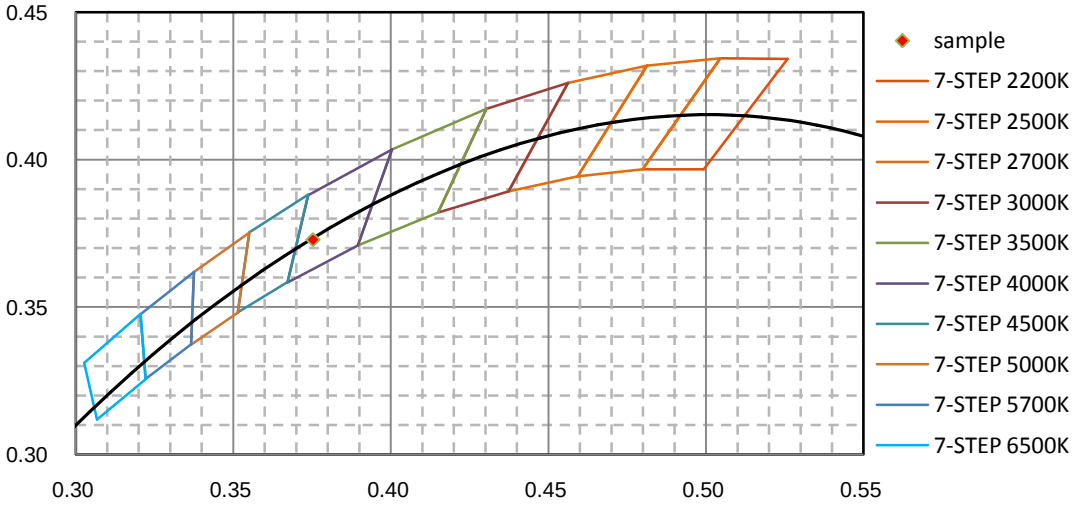
nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	3.166E+00	421	1.095E+01	462	2.410E+02	503	1.819E+02	544	2.534E+02
381	3.339E+00	422	1.270E+01	463	2.283E+02	504	1.855E+02	545	2.537E+02
382	2.777E+00	423	1.464E+01	464	2.184E+02	505	1.897E+02	546	2.552E+02
383	2.996E+00	424	1.676E+01	465	2.105E+02	506	1.930E+02	547	2.565E+02
384	2.505E+00	425	1.897E+01	466	2.034E+02	507	1.960E+02	548	2.579E+02
385	2.193E+00	426	2.143E+01	467	1.978E+02	508	1.998E+02	549	2.594E+02
386	2.066E+00	427	2.480E+01	468	1.912E+02	509	2.030E+02	550	2.604E+02
387	1.947E+00	428	2.819E+01	469	1.833E+02	510	2.057E+02	551	2.619E+02
388	1.850E+00	429	3.214E+01	470	1.756E+02	511	2.083E+02	552	2.630E+02
389	2.054E+00	430	3.634E+01	471	1.673E+02	512	2.112E+02	553	2.646E+02
390	1.462E+00	431	4.128E+01	472	1.587E+02	513	2.138E+02	554	2.660E+02
391	1.584E+00	432	4.686E+01	473	1.503E+02	514	2.164E+02	555	2.676E+02
392	1.678E+00	433	5.353E+01	474	1.422E+02	515	2.184E+02	556	2.700E+02
393	1.469E+00	434	6.003E+01	475	1.345E+02	516	2.202E+02	557	2.711E+02
394	1.633E+00	435	6.819E+01	476	1.287E+02	517	2.227E+02	558	2.727E+02
395	1.424E+00	436	7.707E+01	477	1.239E+02	518	2.243E+02	559	2.745E+02
396	1.486E+00	437	8.660E+01	478	1.203E+02	519	2.259E+02	560	2.764E+02
397	1.292E+00	438	9.853E+01	479	1.181E+02	520	2.276E+02	561	2.781E+02
398	1.390E+00	439	1.108E+02	480	1.165E+02	521	2.295E+02	562	2.801E+02
399	1.428E+00	440	1.252E+02	481	1.162E+02	522	2.303E+02	563	2.815E+02
400	1.582E+00	441	1.419E+02	482	1.165E+02	523	2.321E+02	564	2.832E+02
401	1.437E+00	442	1.603E+02	483	1.178E+02	524	2.337E+02	565	2.849E+02
402	1.774E+00	443	1.809E+02	484	1.186E+02	525	2.346E+02	566	2.871E+02
403	1.506E+00	444	2.046E+02	485	1.206E+02	526	2.358E+02	567	2.891E+02
404	1.710E+00	445	2.295E+02	486	1.225E+02	527	2.368E+02	568	2.909E+02
405	1.653E+00	446	2.586E+02	487	1.243E+02	528	2.376E+02	569	2.929E+02
406	1.621E+00	447	2.880E+02	488	1.263E+02	529	2.388E+02	570	2.945E+02
407	1.884E+00	448	3.170E+02	489	1.285E+02	530	2.398E+02	571	2.964E+02
408	1.969E+00	449	3.451E+02	490	1.312E+02	531	2.409E+02	572	2.987E+02
409	2.188E+00	450	3.691E+02	491	1.342E+02	532	2.415E+02	573	3.001E+02
410	2.375E+00	451	3.885E+02	492	1.373E+02	533	2.426E+02	574	3.019E+02
411	2.627E+00	452	4.008E+02	493	1.404E+02	534	2.431E+02	575	3.036E+02
412	2.896E+00	453	4.038E+02	494	1.440E+02	535	2.442E+02	576	3.062E+02
413	3.250E+00	454	3.989E+02	495	1.480E+02	536	2.451E+02	577	3.074E+02
414	3.800E+00	455	3.879E+02	496	1.520E+02	537	2.459E+02	578	3.093E+02
415	4.568E+00	456	3.681E+02	497	1.565E+02	538	2.467E+02	579	3.105E+02
416	5.081E+00	457	3.460E+02	498	1.606E+02	539	2.478E+02	580	3.120E+02
417	6.011E+00	458	3.215E+02	499	1.653E+02	540	2.487E+02	581	3.135E+02
418	6.935E+00	459	2.966E+02	500	1.693E+02	541	2.500E+02	582	3.152E+02
419	8.265E+00	460	2.755E+02	501	1.736E+02	542	2.506E+02	583	3.160E+02
420	9.539E+00	461	2.562E+02	502	1.781E+02	543	2.518E+02	584	3.179E+02

nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
585	3.195E+02	626	2.717E+02	667	1.193E+02	708	3.646E+01	749	1.018E+01
586	3.199E+02	627	2.682E+02	668	1.161E+02	709	3.526E+01	750	9.977E+00
587	3.216E+02	628	2.645E+02	669	1.133E+02	710	3.412E+01	751	9.549E+00
588	3.230E+02	629	2.609E+02	670	1.102E+02	711	3.305E+01	752	9.384E+00
589	3.232E+02	630	2.568E+02	671	1.074E+02	712	3.207E+01	753	9.074E+00
590	3.245E+02	631	2.533E+02	672	1.045E+02	713	3.105E+01	754	8.846E+00
591	3.243E+02	632	2.492E+02	673	1.016E+02	714	3.015E+01	755	8.487E+00
592	3.251E+02	633	2.458E+02	674	9.902E+01	715	2.916E+01	756	8.373E+00
593	3.259E+02	634	2.417E+02	675	9.654E+01	716	2.839E+01	757	7.979E+00
594	3.262E+02	635	2.383E+02	676	9.381E+01	717	2.739E+01	758	7.765E+00
595	3.263E+02	636	2.344E+02	677	9.124E+01	718	2.668E+01	759	7.585E+00
596	3.258E+02	637	2.300E+02	678	8.867E+01	719	2.586E+01	760	7.320E+00
597	3.261E+02	638	2.265E+02	679	8.635E+01	720	2.517E+01	761	7.086E+00
598	3.257E+02	639	2.224E+02	680	8.418E+01	721	2.446E+01	762	6.936E+00
599	3.259E+02	640	2.185E+02	681	8.160E+01	722	2.362E+01	763	6.741E+00
600	3.253E+02	641	2.146E+02	682	7.971E+01	723	2.287E+01	764	6.635E+00
601	3.246E+02	642	2.106E+02	683	7.728E+01	724	2.211E+01	765	6.372E+00
602	3.238E+02	643	2.066E+02	684	7.517E+01	725	2.153E+01	766	6.118E+00
603	3.235E+02	644	2.026E+02	685	7.282E+01	726	2.076E+01	767	5.924E+00
604	3.222E+02	645	1.986E+02	686	7.104E+01	727	2.029E+01	768	5.836E+00
605	3.215E+02	646	1.948E+02	687	6.892E+01	728	1.960E+01	769	5.688E+00
606	3.201E+02	647	1.910E+02	688	6.688E+01	729	1.891E+01	770	5.602E+00
607	3.191E+02	648	1.870E+02	689	6.504E+01	730	1.842E+01	771	5.356E+00
608	3.181E+02	649	1.833E+02	690	6.298E+01	731	1.782E+01	772	5.154E+00
609	3.158E+02	650	1.787E+02	691	6.117E+01	732	1.725E+01	773	4.944E+00
610	3.144E+02	651	1.755E+02	692	5.936E+01	733	1.671E+01	774	4.892E+00
611	3.126E+02	652	1.713E+02	693	5.745E+01	734	1.637E+01	775	4.737E+00
612	3.112E+02	653	1.676E+02	694	5.597E+01	735	1.568E+01	776	4.611E+00
613	3.084E+02	654	1.641E+02	695	5.426E+01	736	1.524E+01	777	4.548E+00
614	3.068E+02	655	1.603E+02	696	5.270E+01	737	1.486E+01	778	4.359E+00
615	3.044E+02	656	1.569E+02	697	5.118E+01	738	1.432E+01	779	4.397E+00
616	3.020E+02	657	1.531E+02	698	4.946E+01	739	1.385E+01	780	4.406E+00
617	2.993E+02	658	1.495E+02	699	4.816E+01	740	1.347E+01		
618	2.964E+02	659	1.459E+02	700	4.669E+01	741	1.300E+01		
619	2.933E+02	660	1.427E+02	701	4.511E+01	742	1.266E+01		
620	2.912E+02	661	1.389E+02	702	4.370E+01	743	1.224E+01		
621	2.879E+02	662	1.356E+02	703	4.240E+01	744	1.188E+01		
622	2.850E+02	663	1.325E+02	704	4.120E+01	745	1.150E+01		
623	2.823E+02	664	1.283E+02	705	3.977E+01	746	1.121E+01		
624	2.781E+02	665	1.253E+02	706	3.866E+01	747	1.080E+01		
625	2.743E+02	666	1.226E+02	707	3.728E+01	748	1.055E+01		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Downward**

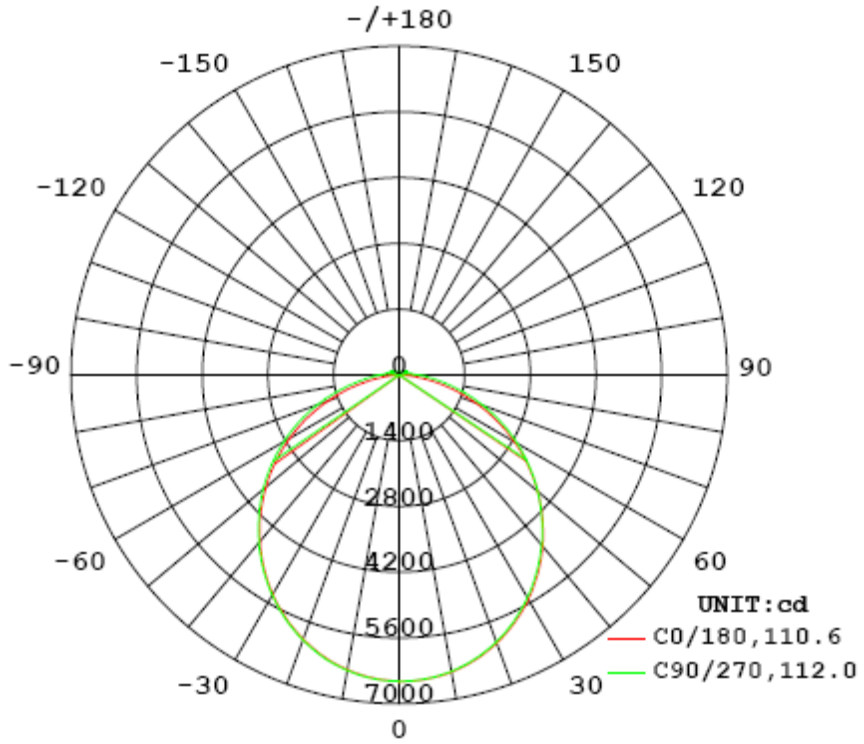
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.1	60	1.280	153.0	0.9950

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I_{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
19151.4	125.19	6521	1.26	1.25

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I_{max}):	110.6	111.7	112.0	111.7	111.5
Field Angle (10% I_{max}):	159.2	164.2	168.9	164.1	164.1

Luminous Intensity (cd) Distribution Data

C / γ	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	6520	6520	6520	6520	6520	6520	6520	6520
5.0°	6477	6479	6479	6481	6486	6490	6494	6498
10.0°	6373	6375	6376	6381	6387	6396	6405	6413
15.0°	6210	6211	6214	6217	6227	6241	6255	6267
20.0°	5990	5992	5993	5996	6009	6025	6047	6063
25.0°	5717	5719	5720	5723	5735	5757	5784	5803
30.0°	5396	5399	5400	5403	5416	5441	5471	5493
35.0°	5029	5036	5038	5041	5057	5082	5114	5136
40.0°	4624	4633	4639	4646	4661	4688	4719	4740
45.0°	4185	4200	4211	4220	4239	4263	4290	4307
50.0°	3716	3736	3755	3772	3793	3815	3835	3843
55.0°	3221	3248	3277	3303	3326	3343	3355	3350
60.0°	2701	2737	2782	2818	2844	2857	2855	2835
65.0°	2166	2212	2273	2320	2352	2359	2341	2303
70.0°	1616	1676	1755	1819	1856	1854	1817	1758
75.0°	1072	1146	1249	1332	1372	1360	1302	1216
80.0°	566	654	785	892	940	914	826	708
85.0°	158	268	435	569	615	582	459	298
90.0°	4	92	240	358	406	365	250	98
95.0°	2	29	180	268	305	272	183	41
100.0°	2	31	54	133	227	163	3	27
105.0°	3	43	125	3	18	3	89	42
110.0°	2	41	121	194	132	158	122	40
115.0°	2	37	112	182	208	183	113	37
120.0°	3	33	103	164	186	165	103	33
125.0°	3	29	91	145	164	146	92	29
130.0°	3	25	80	126	143	127	81	25
135.0°	4	21	68	108	122	108	69	21
140.0°	4	17	57	90	103	91	57	17
145.0°	5	13	46	74	84	74	46	13
150.0°	6	7	35	58	66	58	36	9
155.0°	7	7	25	42	49	43	26	7
160.0°	7	8	17	29	33	29	17	7
165.0°	7	7	8	16	19	16	8	7
170.0°	7	7	7	7	7	7	7	7
175.0°	7	7	7	7	6	7	7	7
180.0°	6	6	6	6	6	6	6	6

Luminous Intensity (cd) Distribution Data (cont.)

C / γ	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	6520	6520	6520	6520	6520	6520	6520	6520
5.0°	6501	6501	6500	6497	6494	6490	6486	6481
10.0°	6420	6420	6419	6414	6407	6399	6391	6382
15.0°	6278	6279	6277	6269	6258	6247	6235	6223
20.0°	6076	6079	6076	6064	6050	6036	6023	6008
25.0°	5820	5824	5820	5805	5786	5771	5757	5739
30.0°	5512	5518	5514	5495	5473	5456	5443	5424
35.0°	5157	5166	5162	5141	5119	5100	5084	5063
40.0°	4760	4771	4771	4751	4726	4708	4689	4664
45.0°	4326	4341	4345	4328	4303	4284	4262	4231
50.0°	3856	3879	3889	3879	3857	3834	3807	3769
55.0°	3360	3389	3412	3407	3392	3365	3329	3282
60.0°	2838	2875	2909	2918	2904	2874	2831	2772
65.0°	2295	2343	2393	2415	2408	2374	2316	2245
70.0°	1739	1799	1866	1906	1907	1869	1797	1708
75.0°	1192	1265	1353	1407	1417	1373	1290	1185
80.0°	663	751	871	956	980	927	817	685
85.0°	221	325	480	596	631	575	444	280
90.0°	18	100	249	361	398	348	229	84
95.0°	1	32	170	254	283	246	161	22
100.0°	2	23	35	207	252	201	32	22
105.0°	2	41	30	2	2	2	39	37
110.0°	2	41	116	80	50	85	110	37
115.0°	2	39	110	176	197	171	104	35
120.0°	2	36	102	159	178	155	96	32
125.0°	3	33	92	143	158	139	87	30
130.0°	3	30	82	125	139	122	78	27
135.0°	3	26	71	107	120	105	69	24
140.0°	4	21	60	91	102	91	59	22
145.0°	4	15	47	74	85	76	52	20
150.0°	4	4	35	57	68	63	44	19
155.0°	5	6	22	42	52	50	37	18
160.0°	5	5	9	27	36	37	29	16
165.0°	5	5	5	13	22	23	19	5
170.0°	6	5	5	5	5	5	5	6
175.0°	6	6	6	5	6	5	6	6
180.0°	6	6	6	6	6	6	6	6

Zonal Lumen Density Measurement

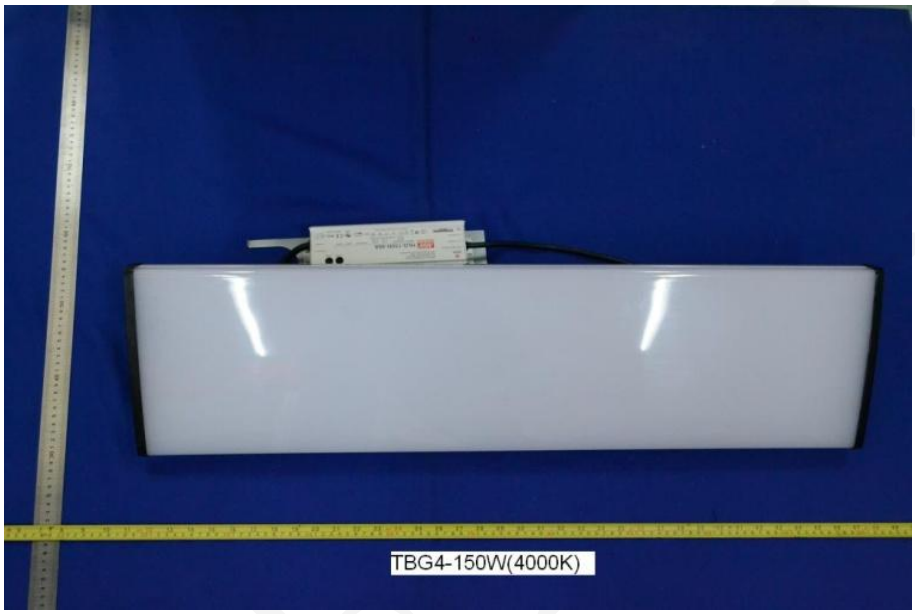
Deg	Flux (lm)	%
0-5	155.5	0.81
5-10	461.0	2.41
10-15	749.9	3.91
15-20	1011.8	5.29
20-25	1237.6	6.46
25-30	1419.9	7.41
30-35	1553.2	8.11
35-40	1633.9	8.54
40-45	1660.6	8.67
45-50	1633.5	8.53
50-55	1554.1	8.11
55-60	1425.7	7.44
60-65	1252.5	6.54
65-70	1041.5	5.44
70-75	803.3	4.20
75-80	556.9	2.90
80-85	331.1	1.73
85-90	172.6	0.90
90-95	100.8	0.53
95-100	68.0	0.36
100-105	24.1	0.12
105-110	27.9	0.15
110-115	52.2	0.27
115-120	49.5	0.26
120-125	42.4	0.22
125-130	35.3	0.18
130-135	28.6	0.15
135-140	22.4	0.12
140-145	16.9	0.09
145-150	12.0	0.06
150-155	8.0	0.04
155-160	4.9	0.03
160-165	2.5	0.01
165-170	1.0	0.01
170-175	0.4	0.00
175-180	0.1	0.00

Deg	Flux (lm)	%
0-5	155.5	0.81
0-10	616.5	3.22
0-15	1366.4	7.13
0-20	2378.2	12.42
0-25	3615.8	18.88
0-30	5035.7	26.29
0-35	6588.9	34.40
0-40	8222.7	42.94
0-45	9883.3	51.61
0-50	11516.8	60.14
0-55	13070.9	68.25
0-60	14496.5	75.69
0-65	15749.0	82.23
0-70	16790.6	87.67
0-75	17593.8	91.87
0-80	18150.7	94.77
0-85	18481.8	96.50
0-90	18654.4	97.40
0-95	18755.2	97.93
0-100	18823.2	98.29
0-105	18847.3	98.41
0-110	18875.1	98.56
0-115	18927.3	98.83
0-120	18976.9	99.09
0-125	19019.3	99.31
0-130	19054.6	99.49
0-135	19083.2	99.64
0-140	19105.6	99.76
0-145	19122.4	99.85
0-150	19134.4	99.91
0-155	19142.3	99.95
0-160	19147.3	99.98
0-165	19149.8	99.99
0-170	19150.9	100.00
0-175	19151.3	100.00
0-180	19151.4	100.00

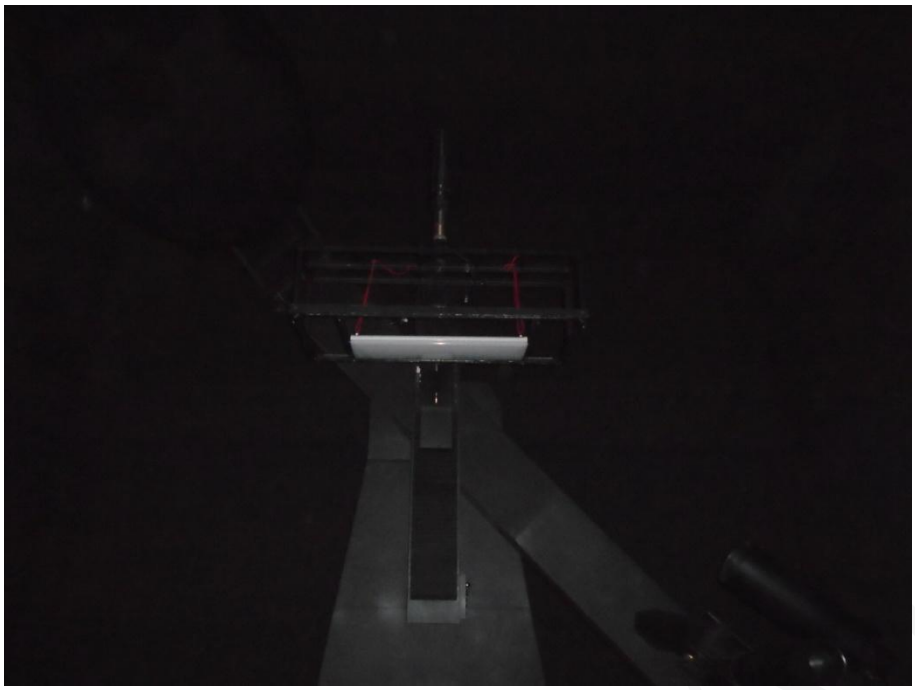
[Additional Test]

Test Item	Test Voltage (V)	Frequency (Hz)	Test Result
Power Factor:	277.0	60	0.9355
Total Harmonic Distortion:	277.0	60	11.50%
Total Harmonic Distortion:	120.0	60	6.67%
Total Harmonic Distortion:	100.0	60	6.80%
Power Factor:	100.0	60	0.997

6. Product Photo



7. Product Test orientation in the Goniophotometer



**********END OF REPORT**********